General

Guideline Title

ACR Appropriateness Criteria® chronic foot pain.

Bibliographic Source(s)

Wise JN, Weissman BN, Appel M, Arnold E, Bancroft L, Bruno MA, Fries IB, Hayes CW, Jacobson JA, Kransdorf MJ, Luchs JS, Morrison WB, Mosher TJ, Murphey MD, Palestro CJ, Roberts CC, Rubin DA, Tuite MJ, Ward RJ, Zoga AC, Expert Panel on Musculoskeletal Imaging. ACR Appropriateness CriteriaÂ® chronic foot pain. [online publication]. Reston (VA): American College of Radiology (ACR); 2013. 10 p. [45 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Wise JN, Daffner RH, Weissman BN, Arnold E, Bennett DL, Blebea JS, Jacobson JA, Morrison WB, Payne WK III, Resnik CS, Roberts CC, Schweitzer ME, Seeger LL, Taljanovic MS, Expert Panel on Musculoskeletal Imaging. ACR Appropriateness Criteria® chronic foot pain. [online publication]. Reston (VA): American College of Radiology (ACR); 2008. 8 p.

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Clinical Condition: Chronic Foot Pain

Variant 1: Chronic foot pain of unknown etiology. First study.

Radiologic Procedure	Rating	Comments	RRL*
X-ray foot	9	See the text below for information on views.	
CT foot without contrast	1		
CT foot with contrast	1		
CT foot without and with contrast	1		
MRI foot without contrast	1		O

Radiologic Procedure	Rating	Comments	RRL*
MRI foot without and with contrast	1		O
Tc-99m bone scan foot	1		
US foot	1		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Adult or child. Painful rigid flat foot. Radiographs unremarkable or equivocal and clinical concern for tarsal coalition.

Radiologic Procedure	Rating	Comments	RRL*
CT foot without contrast	9	CT and MRI are alternative examinations. The RRL for the adult procedure is .	
MRI foot without contrast	9	CT and MRI are alternative examinations.	O
Tc-99m bone scan foot	2		
US foot	2		O
MRI foot without and with contrast	1		O
CT foot with contrast	1	The RRL for the adult procedure is .	
CT foot without and with contrast	1	The RRL for the adult procedure is .	
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Radiographs unremarkable or equivocal and clinical concern for complex regional pain syndrome type I.

Radiologic Procedure	Rating	Comments	RRL*
Tc-99m 3-phase bone scan foot	8		
US foot	2		O
MRI foot without contrast	2		O
CT foot without contrast	2		
MRI foot without and with contrast	1		O
CT foot with contrast	1		
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative

CT foot without and with contrast	1		
Radiologic Procedure	Rating	Comments	RRL*
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 4: Adult or child. Radiographs noncontributory. Pain and tenderness over head of second metatarsal and clinical concern for Freiberg infraction.

Radiologic Procedure	Rating	Comments	RRL*
X-ray foot	9	Perform AP and lateral views, with or without oblique views.	
MRI foot without contrast	2		O
MRI foot without and with contrast	2		O
CT foot without contrast	2	The RRL for the adult procedure is .	
CT foot with contrast	2	The RRL for the adult procedure is .	
CT foot without and with contrast	2	The RRL for the adult procedure is .	
Tc-99m bone scan foot	2		
US foot	2		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 5: Pain and tenderness over tarsus, unresponsive to conservative therapy. Radiographs showed accessory ossicle.

Radiologic Procedure	Rating	Comments	RRL*
MRI foot without contrast	9		O
Tc-99m bone scan foot	5	High-resolution techniques are preferred with this procedure.	
CT foot with contrast	3		
CT foot without and with contrast	3		
MRI foot without and with contrast	2		O
CT foot without contrast	2		
US foot	2		O

Radiologic Procedure	Rating	Comments	RRL*
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 6: Radiographs unremarkable, equivocal, or further diagnostic information needed. Clinical concern for inflammatory arthropathy, including rheumatoid arthritis.

Radiologic Procedure	Rating	Comments	RRL*
MRI foot without and with contrast	9	See statement regarding contrast in text below under "Anticipated Exceptions."	O
MRI foot without contrast	8		O
US foot	5	This procedure should be performed with power Doppler.	O
Tc-99m bone scan foot	1		
CT foot without and with contrast	1		
CT foot with contrast	1		
CT foot without contrast	1		
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 7: Localized pain at the plantar aspect of the heel. Radiographs unremarkable or equivocal. Clinical concern for plantar fasciitis.

Radiologic Procedure	Rating	Comments	RRL*
MRI foot without contrast	9		O
US foot	6		O
CT foot without and with contrast	3		
MRI foot without and with contrast	2		O
Tc-99m bone scan foot	2		
CT foot without contrast	1		
CT foot with contrast	1		
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 8: Burning pain and paresthesias along the plantar surface of the foot and toes. Radiographs unremarkable or equivocal. Clinical concern for tarsal tunnel syndrome.

Radiologic Procedure	Rating	Comments	RRL*
MRI foot without contrast	9		O
MRI foot without and with contrast	7	See statement regarding contrast in text below under "Anticipated Exceptions."	O
US foot	5	There is limited data on this procedure.	O
CT foot without and with contrast	3		
Tc-99m bone scan foot	2		
CT foot without contrast	1		
CT foot with contrast	1		
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 9: Pain in the 3–4 web space with radiation to the toes. Radiographs unremarkable or equivocal. Clinical concern for Morton neuroma.

Radiologic Procedure	Rating	Comments	RRL*
MRI foot without and with contrast	9	MRI and US are alternative examinations. See statement regarding contrast in text below under "Anticipated Exceptions."	O
US foot	9	MRI and US are alternative examinations.	O
MRI foot without contrast	7		O
CT foot without and with contrast	2		
CT foot with contrast	2		
Tc-99m bone scan foot	2		
CT foot without contrast	1		
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 10: Athlete with pain and tenderness over tarsal navicular. Radiographs unremarkable or equivocal. Clinical concern for stress injury or

occult fracture.

Radiologic Procedure	Rating	Comments	RRL*
MRI foot without contrast	9		O
CT foot without contrast	6	This procedure is especially used for follow-up of healing fractures.	
MRI foot without and with contrast	2		O
Tc-99m bone scan foot	2	Perform this procedure if MRI cannot be performed.	
US foot	2		O
CT foot with contrast	1		
CT foot without and with contrast	1		
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 11: Radiographs unremarkable or equivocal and with persistent clinical concern for tendinopathy.

Radiologic Procedure	Rating	Comments	RRL*
MRI foot without contrast	9		O
US foot	7		O
MRI foot without and with contrast	5	See statement regarding contrast in text below under "Anticipated Exceptions."	O
CT foot without and with contrast	3		
CT foot without contrast	1		
CT foot with contrast	1		
Tc-99m bone scan foot	1		
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of the Literature Review

Some of the conditions that cause chronic foot pain (>6 weeks in duration), as well as related imaging techniques, are reviewed in the original guideline document.

Tarsal Coalition

Tarsal coalition is a congenital abnormality resulting from fibrous, cartilaginous, or osseous union of 2 or more tarsal bones. Calcaneonavicular and

middle-facet talocalcaneal coalitions are the most common. In about 20% to 25% of patients the coalition is bilateral. Calcaneonavicular coalition is easily detected on oblique radiographs of the foot and confirmed by computed tomography (CT). Talocalcaneal (subtalar) coalition is often associated with valgus deformity of the hind foot, rigid painful flat foot, and restricted subtalar motion. It is frequently overlooked on standard foot radiographs because of overlapping structures; however, secondary signs on the lateral view could suggest a subtalar coalition. These signs include talar beaking, flattening and broadening of the lateral talar process, positive C-sign, ball-and-socket ankle joint, and narrowing of the posterior talocalcaneal joint. A well-penetrated axial view (Harris-Beath view) can demonstrate the posterior and middle subtalar joints.

CT of the foot with acquisition or reconstructions perpendicular to the subtalar joint is usually diagnostic. Also, the CT examination typically includes visualization of the other foot. Magnetic resonance imaging (MRI) has been shown to be effective in depicting all types of coalition. Inversion-recovery MRI can reveal bone marrow edema along the margins of the abnormal articulation, which is an important clue to the diagnosis. MRI provides a more sensitive and specific evaluation of the surrounding soft tissues than does CT in general.

Complex Regional Pain Syndrome Type I

Complex regional pain syndrome type I (CRPS I), is characterized clinically by pain, tenderness, swelling, diminished motor function, and vasomotor instability. Associated conditions of the foot include fractures and other trauma, central nervous system (CNS) and spinal disorders, and peripheral nerve injury. CRPS I has also been described in children; the patients are predominantly girls. Early diagnosis favorably affects outcome. Diffuse osteopenia of the involved part is seen in 69% of patients who have CRPS I. The osteopenia patterns are not pathognomonic and can be seen as a result of disuse. Three-phase radionuclide bone scans have been used to diagnose CRPS. One study reported a characteristic delayed bone scan pattern consisting of diffuse increased tracer throughout the foot, with juxta-articular accentuation of tracer uptake. Overall sensitivity in this study was 100%, specificity 80%, positive predictive value 54%, and negative predictive value 100%. There are no specific findings on MRI in patients who have CRPS I. Patients who have CRPS I of the lower extremity have increased power Doppler flow compared with asymptomatic control subjects.

Avascular Necrosis of the Metatarsal Head (Freiberg Disease)

This disease is characterized by pain, tenderness, swelling, and motion limitation in the affected metatarsophalangeal (MTP) joint. The disease is usually detected in adolescents, and adolescent girls predominate 3–4:1. Radiographic changes are characteristic and show increased density of the metatarsal head and flattening, collapse, subchondral lucencies, and widening of the MTP joint. The second metatarsal is most commonly affected, although the third and fourth can also be involved.

Painful Accessory Bones

Potentially painful normal variants such as accessory navicular and os trigonum have been described. Pain in the presence of an accessory navicular has been attributed to traumatic or degenerative changes at the synchondrosis or to soft-tissue inflammation. Symptomatic accessory navicular bones have been studied with radionuclide bone scans and MRI. Symptomatic lesions are reported to show increased radiotracer uptake or marrow edema across the synchondrosis.

For a painful os trigonum, selective arthrography of the synchondrosis followed by local anesthetic injection localizes the source of pain.

Arthritis

All the common forms of arthritis, including rheumatoid and seronegative arthritis, affect the feet and can cause chronic foot pain. Most arthritides are commonly evaluated with radiography. There is evidence that gadolinium-enhanced MRI can help detect early rheumatoid arthritis and seronegative arthritis. MRI is also more sensitive than radiography in detecting erosive changes.

Ultrasound (US) can provide nearly the sensitivity and specificity of a contrast-enhanced MRI in the examination of the foot for synovitis and tenosynovitis but is more operator-dependent. US evaluation can provide information in addition to clinical examination, which significantly impacts the initial diagnosis and treatment strategy in patients who have inflammatory arthropathy.

Chronic heel pain can be caused by calcaneal stress fractures, tarsal tunnel syndrome, and plantar fasciitis. When the heel pain is bilateral, the seronegative arthritides warrant consideration.

Plantar Fasciitis

Plantar fasciitis is the most common cause of plantar heel pain. It can occur in isolation or as a manifestation of a systemic disease such as the seronegative spondyloarthropathies, rheumatoid arthritis, gout, or systemic lupus erythematosus. In athletes, plantar fasciitis is a common cause of foot pain and is attributed to mechanical stresses, presumably due to repetitive trauma, which causes plantar fascia microtearing at its origin as well as fascial and perifascial inflammation. Plantar fasciitis is also common in obese patients and in patients who have flat feet. Though radiography is

typically insensitive to fasciitis, it should be the initial study. Bone scintigraphy and MRI have been shown to be help arrive at this diagnosis. US has been shown to be effective in differentiating the normal plantar fascia from tissue involved with plantar fasciitis.

Tarsal Tunnel Syndrome

This syndrome is a compressive neuropathy of the posterior tibial nerve or one of its branches. Patients typically complain of poorly localized burning pain and paresthesias along the plantar surface of the foot and toes. Inflammatory processes or mass lesions in the tarsal tunnel are described as the cause for this syndrome in most affected patients. Such lesions are best imaged by MRI.

Interdigital (Morton) Neuroma

Morton neuroma is a non-neoplastic perineural fibrous proliferation involving a plantar digital nerve. Clinical symptoms include pain in the involved web space that often radiates to the toes. It is frequently asymptomatic. Morton neuromas are seen more often in women and typically involve the 3–4 or, less commonly, 2–3 intermetatarsal space. They are best detected on MRI using T1-weighted or fat-suppressed T1-weighted images with gadolinium enhancement and T2-weighted images. The diagnosis of Morton neuroma at MRI becomes relevant only when the transverse diameter of the lesion is ≥5 mm and can be correlated with the clinical findings. High-resolution US has been used successfully to diagnose Morton neuromas. US can approach the sensitivity of MRI in detecting Morton neuromas with appropriate operator expertise.

Stress Fractures

Stress fractures can also cause of chronic foot pain (see the National Guideline Clearinghouse [NGC] summary ACR Appropriateness Criteria® stress (fatigue/insufficiency) fracture, including sacrum, excluding other vertebrae).

Tendinopathies

Tendinopathies, ranging from tendinosis to complete tears, in and around the foot can result in significant foot pain and disability. The most commonly affected tendons are the Achilles tendon, posterior tibial tendon, and peroneal tendons. Tendon dysfunction is best imaged with MRI and US.

Hallux Valgus

Hallux valgus is a common foot disorder resulting in significant morbidity. Preoperative evaluation and measurements and postoperative follow-up are best performed with weight-bearing posteroanterior and lateral radiographs of the feet.

Neoplasm

Neoplasm is another cause of chronic foot pain. Diagnostically, these foot lesions can be approached as are other neoplasms in the musculoskeletal system (see the NGC summaries ACR Appropriateness Criteria® soft-tissue masses and ACR Appropriateness Criteria® primary bone tumors).

Osteomyelitis

Osteomyelitis can be a cause of chronic foot pain (see the NGC summary ACR Appropriateness Criteria® suspected osteomyelitis of the foot in patients with diabetes mellitus).

Summary

- Radiography is the foundation for imaging chronic foot pain. It is the initial study or the first step in the imaging algorithm for evaluating pedal pathology.
- CT is the secondary modality of choice to evaluate for tarsal coalition if radiographs are equivocal or unremarkable and clinical concern warrants further imaging evaluation.
- Tc-99m-labeled methylene diphosphonate bone scan is the modality of choice for evaluating CRPS after radiographs or if clinical concern warrants further imaging evaluation.
- MRI or US is complementary to radiography.
- In evaluating for inflammatory arthropathy, plantar fasciitis, tarsal tunnel syndrome, interdigital (Morton) neuroma, and/or tendinopathy, MRI or US is indicated if the initial radiograph is equivocal or unremarkable and clinical concern warrants further imaging.

Anticipated Exceptions

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based

contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m^2), and almost never in other patients. There is growing literature regarding NSF. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73 m^2. For more information, please see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

Abbreviations

- AP, anteroposterior
- CT, computed tomography
- MRI, magnetic resonance imaging
- Tc, technetium
- US, ultrasound

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
	<0.1 mSv	<0.03 mSv
	0.1-1 mSv	0.03-0.3 mSv
	1-10 mSv	0.3-3 mSv
	10-30 mSv	3-10 mSv
	30-100 mSv	10-30 mSv
*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies".		

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Chronic foot pain

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Family Practice

Internal Medicine

Nuclear Medicine

Orthopedic Surgery

Pediatrics

Podiatry

Radiology

Rheumatology

Sports Medicine

Intended Users

Health Plans

Hospitals

Managed Care Organizations

Physicians

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of initial radiologic examinations for chronic foot pain

Target Population

Patients with chronic foot pain

Interventions and Practices Considered

1. X-ray foot
2. Computed tomography (CT) foot
    - Without contrast
    - With contrast
    - Without and with contrast
3. Magnetic resonance imaging (MRI) foot
    - Without contrast
    - Without and with contrast
4. Technetium (Tc)-99m bone scan foot
5. Ultrasound (US) foot

Major Outcomes Considered

Utility of radiologic examinations in differential diagnosis

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Procedure

Staff will search in PubMed only for peer reviewed medical literature for routine searches. Any article or guideline may be used by the author in the narrative but those materials may have been identified outside of the routine literature search process.

The Medline literature search is based on keywords provided by the topic author. The two general classes of keywords are those related to the condition (e.g., ankle pain, fever) and those that describe the diagnostic or therapeutic intervention of interest (e.g., mammography, MRI).

The search terms and parameters are manipulated to produce the most relevant, current evidence to address the American College of Radiology Appropriateness Criteria (ACR AC) topic being reviewed or developed. Combining the clinical conditions and diagnostic modalities or therapeutic procedures narrows the search to be relevant to the topic. Exploding the term "diagnostic imaging" captures relevant results for diagnostic topics.

The following criteria/limits are used in the searches.

1. Articles that have abstracts available and are concerned with humans.
2. Restrict the search to the year prior to the last topic update or in some cases the author of the topic may specify which year range to use in the search. For new topics, the year range is restricted to the last 10 years unless the topic author provides other instructions.
3. May restrict the search to Adults only or Pediatrics only.
4. Articles consisting of only summaries or case reports are often excluded from final results.

The search strategy may be revised to improve the output as needed.

Number of Source Documents

The total number of source documents identified as the result of the literature search is not known.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Strength of Evidence Key

Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis, and results.

Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.

Category 3 - The conclusions of the study may be valid, but the evidence supporting the conclusions is inconclusive or equivocal.

Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author drafts or revises the narrative text summarizing the evidence found in the literature. American College of Radiology (ACR) staff draft an evidence table based on the analysis of the selected literature. These tables rate the strength of the evidence (study quality) for each article included in the narrative text.

The expert panel reviews the narrative text, evidence table, and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the table. Each individual panel member assigns a rating based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Rating Appropriateness

The appropriateness ratings for each of the procedures included in the Appropriateness Criteria topics are determined using a modified Delphi methodology. A series of surveys are conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. American College of Radiology (ACR) staff distribute surveys to the panelists along with the evidence table and narrative. Each panelist interprets the available evidence and rates each procedure. The surveys are completed by panelists without consulting other panelists. The appropriateness rating scale is an ordinal scale that uses integers from 1 to 9 grouped into three categories: 1, 2, or 3 are in the category "usually not appropriate"; 4, 5, or 6 are in the category "may be appropriate"; and 7, 8, or 9 are in the category "usually appropriate." Each panel member assigns one rating for each procedure for a clinical scenario. The ratings assigned by each panel member are presented in a table displaying the frequency distribution of the ratings without identifying which members provided any particular rating.

If consensus is reached, the median rating is assigned as the panel's final recommendation/rating. Consensus is defined as eighty percent (80%) agreement within a rating category. A maximum of three rounds may be conducted to reach consensus. Consensus among the panel members must be achieved to determine the final rating for each procedure.

If consensus is not reached, the panel is convened by conference call. The strengths and weaknesses of each imaging procedure that has not reached consensus are discussed and a final rating is proposed. If the panelists on the call agree, the rating is proposed as the panel's consensus. The document is circulated to all the panelists to make the final determination. If consensus cannot be reached on the call or when the document is circulated, "No consensus" appears in the rating column and the reasons for this decision are added to the comment sections.

This modified Delphi method enables each panelist to express individual interpretations of the evidence and his or her expert opinion without excessive influence from fellow panelists in a simple, standardized and economical process. A more detailed explanation of the complete process can be found in additional methodology documents found on the ACR Web site (see the "Availability of Companion Documents" field).

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current literature and expert panel consensus.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Selection of appropriate radiologic imaging procedures for evaluation of patients with chronic foot pain

Potential Harms

Gadolinium-based Contrast Agents

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m^2), and almost never in other patients. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73 m^2. For more information, please see the American College of Radiology (ACR) Manual on Contrast Media (see "Availability of Companion Documents" field).

Relative Radiation Level (RRL)

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

The American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and

severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Living with Illness

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Wise JN, Weissman BN, Appel M, Arnold E, Bancroft L, Bruno MA, Fries IB, Hayes CW, Jacobson JA, Kransdorf MJ, Luchs JS, Morrison WB, Mosher TJ, Murphey MD, Palestro CJ, Roberts CC, Rubin DA, Tuite MJ, Ward RJ, Zoga AC, Expert Panel on Musculoskeletal Imaging. ACR Appropriateness CriteriaÂ® chronic foot pain. [online publication]. Reston (VA): American College of Radiology (ACR); 2013. 10 p. [45 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

1998 (revised 2013)

Guideline Developer(s)

American College of Radiology - Medical Specialty Society

Source(s) of Funding

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Musculoskeletal Imaging

Composition of Group That Authored the Guideline

Panel Members: James N. Wise, MD (*Principal Author*); Barbara N. Weissman, MD (*Panel Chair*); Marc Appel, MD; Erin Arnold, MD; Laura Bancroft, MD; Michael A. Bruno, MD; Ian Blair Fries, MD; Curtis W. Hayes, MD; Jon A. Jacobson, MD; Mark J. Kransdorf, MD; Jonathan S. Luchs, MD; William B. Morrison, MD; Timothy J. Mosher, MD; Mark D. Murphey, MD; Christopher J. Palestro, MD; Catherine C. Roberts, MD; David A. Rubin, MD; Michael J. Tuite, MD; Robert J. Ward, MD; Adam C. Zoga

Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Wise JN, Daffner RH, Weissman BN, Arnold E, Bennett DL, Blebea JS, Jacobson JA, Morrison WB, Payne WK III, Resnik CS, Roberts CC, Schweitzer ME, Seeger LL, Taljanovic MS, Expert Panel on Musculoskeletal Imaging. ACR Appropriateness Criteria® chronic foot pain. [online publication]. Reston (VA): American College of Radiology (ACR); 2008. 8 p.

Guideline Availability

Electronic copies: Available from the American College of Radiology (ACR) Web site.

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 2013 Apr. 1 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria®. Evidence table development – diagnostic studies. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 90 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 2013 Apr. 1 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria® chronic foot pain. Evidence table. Reston (VA): American College of Radiology; 2013. 13 p. Electronic copies: Available in PDF from the ACR Web site.

Patient Resources

None available

NGC Status

This summary was completed by ECRI on May 6, 2001. The information was verified by the guideline developer as of June 29, 2001. This summary was updated by ECRI on May 22, 2003. The information was verified by the guideline developer on June 23, 2003. This NGC summary was updated by ECRI on January 5, 2006. The updated information was verified by the guideline developer on January 19, 2006. This summary was updated by ECRI Institute on May 17, 2007 following the U.S. Food and Drug Administration (FDA) advisory on Gadolinium-based contrast agents. This summary was updated by ECRI Institute on June 20, 2007 following the U.S. Food and Drug Administration (FDA) advisory on gadolinium-based contrast agents. This summary was updated by ECRI Institute on May 19, 2010. This summary was updated by ECRI Institute on January 13, 2011 following the U.S. Food and Drug Administration (FDA) advisory on gadolinium-based contrast agents. This NGC summary was updated by ECRI Institute on February 27, 2014.

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